Geophysical Research Abstracts
Vol. 21, EGU2019-8582, 2019
EGU General Assembly 2019

Combining Plate Tectonics and Paleoclimate with a Source-to-Sink Mind-Set: Gaining a Holistic Understanding of the Atlantic Region during the Cretaceous

Benjamin Gréselle and Graeme Nicoll
Neftex Insights, Halliburton, UK (benjamin.greselle@halliburton.com)

Individual source-to-sink studies are often a laborious undertaking, even for just a small area of interest, because of the large array of unstructured data from specialized disciplines necessary. Paleoclimate work similarly requires huge amounts of data inputs in addition to computational power. Consequently, these types of studies are not routinely performed within the typical natural resource exploration workflow.

The creation of a globally consistent and standardized geological framework yields significant dividends for understanding the Earth's 4D evolution. Integrating advanced items, such as regional seismic interpretations, plate tectonic models and paleoclimate predictions all within a standardised temporal and spatial framework, allows for the creation of a truly dynamic next-generation holistic Earth model. With an understanding of the complete sedimentary system within its tectonic and climatic context the clastic systems are assessed in the central Atlantic region during the Cretaceous period. The integration of data-constrained tectonic modelling and depositional environments allows modelling of hypsometry, bathymetry and digital drainage, which, in turn, are used to run a series of atmosphere-hydrosphere paleoclimate simulations at a global scale. A database of climate-sensitive sedimentological proxies provides a valuable means for independently testing the veracity of model results and determining the most likely global climate states for the investigated time slices. Having clean readily useable data significantly reduces the time and resources necessary to arrive at these advanced concepts and models, allowing more time for interpretation.

This work highlights, on five Cretaceous time slices, how holistic modelling significantly changes predictions about the areal extent of the hinterland region being eroded and thus the quality of sediments subsequently produced. Climatic effects to drainage systems throughout the Cretaceous also influence flux while changing tidal range and ocean current directions have an effect on the redistribution of sediments once they enter the sink. Additional data constraints (e.g., reservoir quality and seismic data) are used to verify model predictions and provide confidence for the extrapolation of model results into data poor and frontier regions.